

Infectious Hepatitis Outbreak Associated With Cafe Water

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BETWEEN July 1, 1969, and July 1, 1970, a total of 53,039 cases of infectious hepatitis were reported to the Center for Disease Control (CDC) by State health departments (1). In the same period CDC investigated four unrelated waterborne outbreaks of infectious hepatitis comprising 190 cases (references 2-4 and an outbreak in North Carolina, described by Dr. J. D. Hamilton at the Epidemic Intelligence Service Conference in Atlanta, Ga., in April 1970).

Although other outbreaks may

have occurred that were either unrecognized (5) or unreported, it is generally thought that waterborne infections have accounted for a very small percentage of hepatitis cases in the United States (6,7). Nonetheless, outbreaks of waterborne hepatitis have tended to affect communities tremendously because of their potential magnitude and degree of morbidity. Since outbreaks can be prevented by proper sanitation, public awareness of this problem should be rearoused regularly.

During May, June, and July 1970, an unusual common-source outbreak of infectious hepatitis occurred among residents of Polk County, Ark., and surrounding counties in Arkansas and Oklahoma. Epidemiologic and laboratory evidence incriminated the water of one particular cafe in Hatfield, Ark., as the source of the outbreak.

Background

Polk County (population 13,041, 1970 census) is located in the foothills of the Ouachita Mountains in western Arkansas, adjacent to Oklahoma (fig. 1). Mena, Ark., (population 4,481, 1970 census) is the county seat and commercial center for the area. Lumber, poultry, and farming dominate the area's economy. The epidemic centered in Hatfield (population 361, 1970 census), a rustic community 11 miles south of Mena. The town has neither a municipal water system nor a municipal sewerage system. Most houses have individual unchlorinated drilled wells and indoor plumbing with septic tanks or cesspools; some houses still have outside privies.

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Before 1970, viral hepatitis had never been a known major public health problem in Polk County or Hatfield. In the 9-year period 1961–69, an annual average of 6.7 cases was reported in Polk County. The peak year was 1964, with 28 cases, most of which were linked to two separate outbreaks in Mena and in Hatfield. In the first 8 months of 1970, 86 cases in Polk County were reported to the Arkansas State Department of Health; of these, 24 occurred in Hatfield. This marked increase in reported cases suggested epidemic hepatitis (fig. 2).

Method

The epidemic investigation was conducted from mid-June to mid-August 1970. All persons from Polk County and the surrounding counties with reported hepatitis were interviewed. Questions concerning infections were asked among friends and families, and the records of all hospitalized patients were reviewed. Reporting was aided by local newspaper publicity and periodic telephone calls to each of the 11 private physicians serving the area.

Hepatitis was diagnosed if a patient reported a history of jaundice that could not be attributed to other underlying liver or biliary disease. No attempt was made to identify anicteric cases. Serum was not tested for hepatitis-associated (Australia) antigen.

Results

Between January 1 and August 1, 1970, there were 101 icteric cases of viral hepatitis in Polk County and surrounding areas. Of the 101 identified patients, 16 were hospitalized. There were no deaths. Most

cases were clustered by dates of onset in May, June, and July (fig. 3), and most were geographically clustered in and near the town of Hatfield. However, census data for the specific communities were not available to calculate attack rates. The epi-

demio curve and geographic clustering of cases strongly suggested a common-source epidemic.

No community or church gatherings that could have served as a source of epidemic hepatitis occurred near Hatfield in March, April, or May. Milk seemed un-

Figure 1. Hatfield, Polk County, Ark.

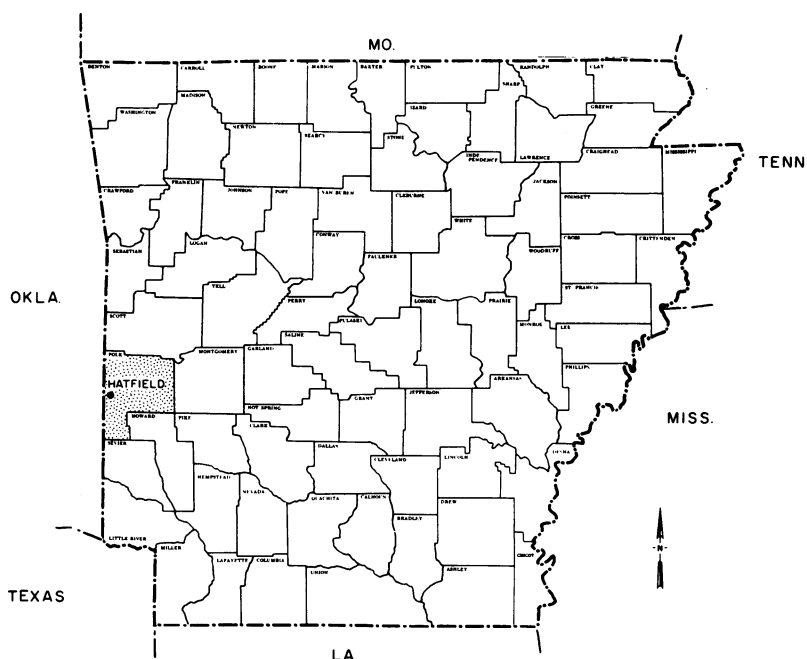


Figure 2. Reported cases of viral hepatitis, 1961 through August 1970

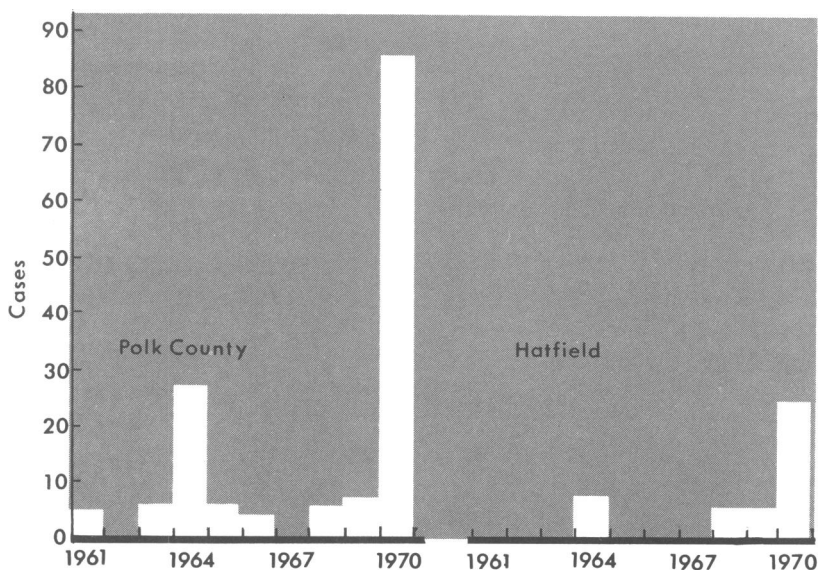
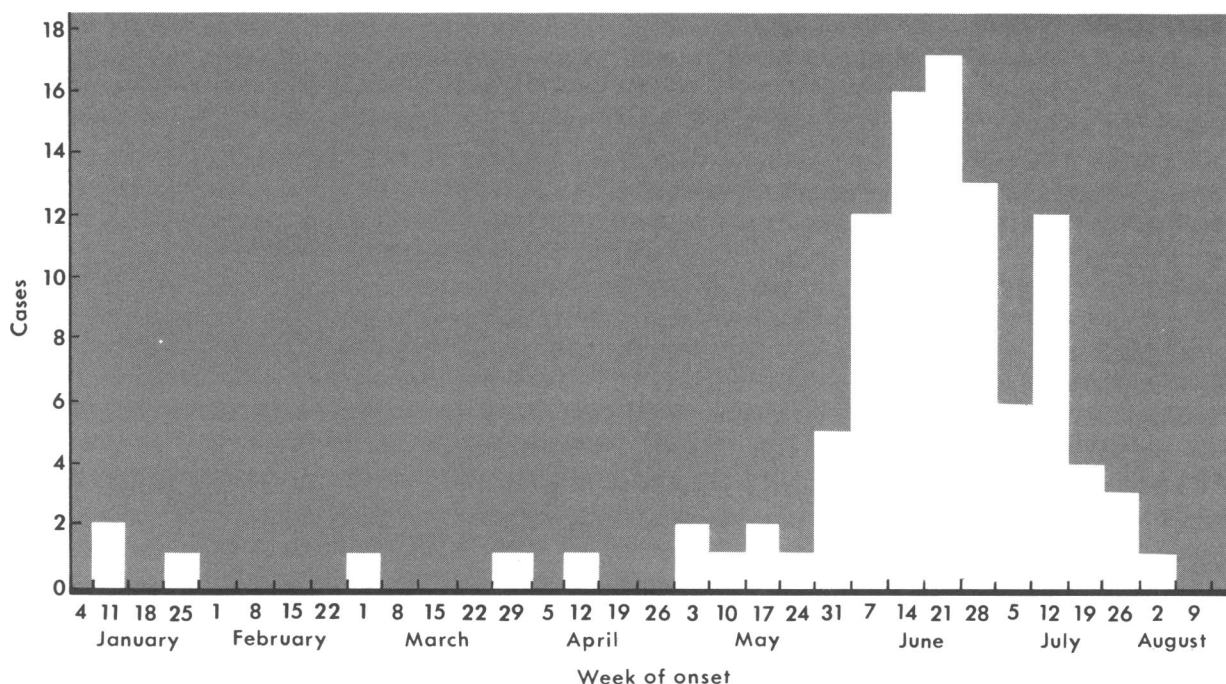


Figure 3. Cases of viral hepatitis, by week of onset, Polk County, Ark., and surrounding areas, 1970



likely as a vehicle of infection because the products of the three commercial dairies in the area were distributed regionally. The only municipal water supply in the county was in Mena, and the geographic distribution of cases did not incriminate Mena as the source of the epidemic.

In further efforts to find a possible common source, the 95 persons with onset of the disease in May, June, or July were interviewed regarding patronage of area restaurants and cafes. Of the 95 patients, 79 recalled patronizing one particular cafe in Hat-

field. Six patients were household contacts of the 79. The remaining 10 could not be related epidemiologically to the outbreak.

To evaluate the significance of cafe patronage, a comparison group of 470 non-ill persons from the Hatfield area were also interviewed. Only 19 percent of the comparison group had patronized the suspect cafe between mid-April and mid-June, contrasted with 83 percent of the patients. Less than 10 percent of either group had patronized the only other cafe in Hatfield (table 1).

Table 1. Comparison of hepatitis patients having onsets in May, June, and July with non-ill controls, Hatfield, Ark.

Status	Number interviewed	Cafe patrons	Percent	Significance of patronage
Suspect cafe:				
Ill.....	95	79	83	$\chi^2 = 151.4; P < 0.001$
Non-ill.....	470	90	19	
Other cafe: ¹				
Ill.....	83	6	7	$\chi^2 = 0.011; P > 0.9$
Non-ill.....	439	30	7	

¹ 12 patients and 31 controls were not questioned about patronizing this cafe.

The suspect cafe first opened April 13, 1970. It specialized in short orders and served three meals a day, 6 days a week. The proprietress of the cafe estimated that she served 100 people a day. The cafe appeared clean, and

Table 2. Age group and sex distribution of hepatitis patients having onsets in May, June, and July, Hatfield, Ark., January-August 1970

Age group (years)	Male	Female	Total
Total.....	70	25	95
0-4.....	1	1	2
5-9.....	2	3	5
10-14.....	9	5	14
15-19.....	15	7	22
20-24.....	17	3	20
25-29.....	4	2	6
30-34.....	8	0	8
35-39.....	8	0	8
40-44.....	2	1	3
45-49.....	0	1	1
50-54.....	2	0	2
55-59.....	0	0	0
60-64.....	1	1	2
65 or over.....	0	0	0
Unknown.....	1	1	2

Table 3. Relationship of hepatitis and water consumption in persons who had patronized the suspect cafe, Hatfield, Ark.

Status	Number interviewed	Drank water	Percent	Significance
Ill ¹	78	76	97	} $\chi^2 = 33.6; P < 0.001$
Non-ill ²	53	29	55	

¹ 1 patient not questioned.

² 37 controls did not respond to questionnaire.

from all indications its method of handling, storing, and refrigerating food appeared adequate. Milk and soft drinks were stored in individual containers. The proprietress described the customers as primarily young working men. This description corresponded to the age and sex distribution of the 95 patients with onsets in May, June, and July (table 2).

Having identified the cafe as the most likely common source of epidemic hepatitis, food histories were obtained from 78 of the 79 patrons who were ill. No single food item was common to a majority of these customers; however, 76 or 97 percent recalled drinking its water. For comparison, the 90 controls who had patronized the cafe were re-surveyed, and only 29 or 55 per-

cent of the 53 who responded admitted to drinking the water (table 3).

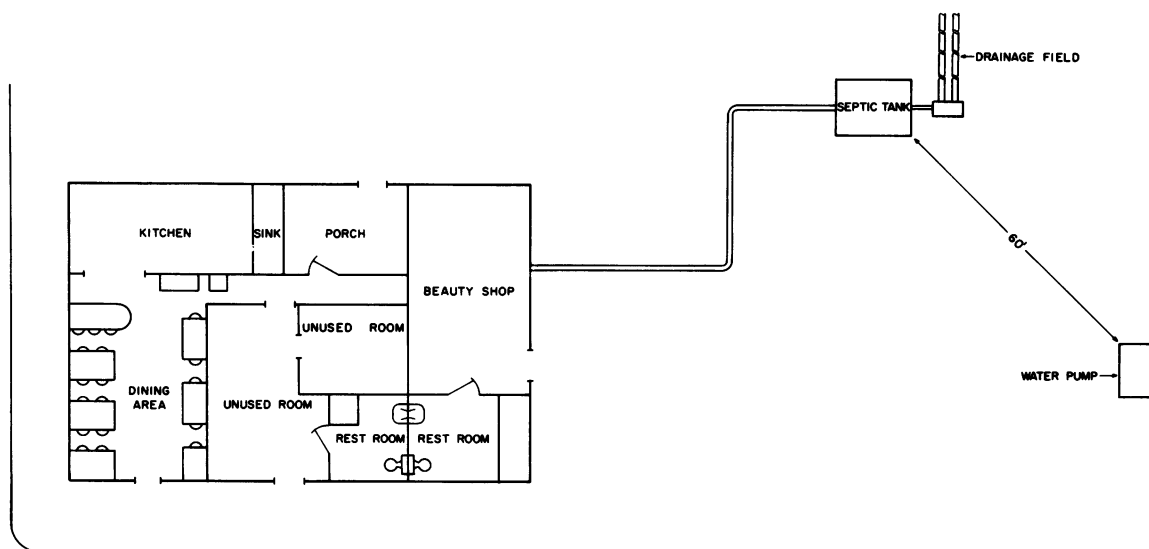
The cafe was located in a building that had been unused for approximately 2 years before being renovated in April 1970. The building contained two rest-rooms, but neither was adjacent to the dining room or kitchen (fig. 4). One of these facilities was used regularly by cafe personnel but only infrequently by patrons; the other was located in an adjoining beauty shop and was seldom used.

The source of water for the cafe was a well drilled through shale to a depth of 49 feet. It was cased to an undetermined depth in asphalt-asbestos piping and had a concrete casing that extended 4 inches above the

ground. The well was capped with household aluminum foil. Although the well was only 60 feet from the septic tank that served the cafe, surface contamination was unlikely because the top of the well was elevated more than 2 feet above the septic tank (fig. 5). There was no other likely source of surface contamination.

Water collected from kitchen faucets in the cafe on June 16 revealed contamination by coliform bacteria. On June 28 the well was drained and chlorinated with 3 gallons of 5¼ percent sodium hypochlorite. Water samples collected on July 6 (8 days after chlorination) were coliform negative, but six samples collected on July 8 were contaminated. On June 25, fluorescein dye was flushed down the cafe toilet. The dye was not detected in tapwater samples collected on June 26 or June 29, but on July 15 samples taken from the cafe kitchen, an outside faucet, and the well fluoresced under ultraviolet light. Lateral seepage of effluent from the septic tank through underground fissures of

Figure 4. Layout of building and grounds of suspect cafe, Hatfield, Ark.



shale was thought to be the most likely route of contamination.

Realizing that the cafe was the focal point of the epidemic and that cafe water contaminated by effluent from the septic tank was the most likely vehicle of transmission, we sought a possible index patient who had used the building's restrooms in early May. No patient with onset of hepatitis in April or early May admitted use of these facilities. Although the proprietress of the cafe, her family, another employee, and two electricians had used the toilet facilities in April and May, all denied illnesses suggestive of viral hepatitis at that time. The beauty shop had not been opened for business until June.

Brief Case Histories

Several patients had only limited contact with the town of Hatfield, including a visit to the suspect cafe. These case histories reemphasized the epidemiologic

significance of water used at the cafe. None of the following patients had eaten raw shellfish, received blood transfusions, or admitted using parenteral drugs.

An 8-year-old Oklahoma girl and her 6-year-old brother visited the cafe on June 6 with their 19-year-old cousin while their mother kept an appointment at the neighboring beauty shop. The 8-year-old girl had a candy bar and glass of water, while her brother ate only a candy bar. The 19-year-old cousin had a boiled egg and a glass of water. The three made no further visits to Hatfield during the following month. The girl became ill on June 20 and her cousin on July 1; the brother, who drank no water, remained well.

A 35-year-old man who lived just outside of Hatfield infrequently patronized the cafes in Hatfield. On May 29, however, while his wife was visiting relatives in Texas, he ate two meals and drank water at the suspect

cafe. That evening he went to Texas and did not return to Hatfield until June 22, when he began having symptoms of hepatitis.

A newly married couple from Cove, Ark., had breakfast and drank water at the suspect cafe on May 30, the morning after their wedding. This was their only visit to Hatfield, and they had onsets of hepatitis on June 15 and 21.

Four haybalers were in the Hatfield area in mid-June. A 50-year-old farmer, who baled hay near Hatfield on June 10, 11, and 12, stopped at the cafe each morning for coffee and water; his onset of disease was June 26. Three Oklahoma men worked in the area on June 13 and had lunch at the cafe. Each recalled drinking several glasses of ice water. They made no other visits to Hatfield. Their onsets were on July 13, 17, and 19.

A 21-year-old resident of Mena, who worked for a power company, made an emergency call in Hatfield on June 1. While there, he ate lunch and drank water at the suspect cafe. This was his only visit to Hatfield in May or June, and he became ill on July 1.

In all, 25 patients recalled having visited the cafe only 1 day or 2 consecutive days. Each one had patronized the cafe during an 8-week period between early May and mid-June, but a majority (21 of 25) had eaten there during the 3-week period from May 24 to June 14. Their onsets ranged over the 7-week period from June 7 to July 19 (fig. 6). The mean incubation period for these 25 patients was 26.8 days, with a range of 14 to 61 days (fig. 7). Twenty-four recalled drinking the water at the cafe.

Figure 5. Location of suspect septic tank and well, Hatfield Ark.

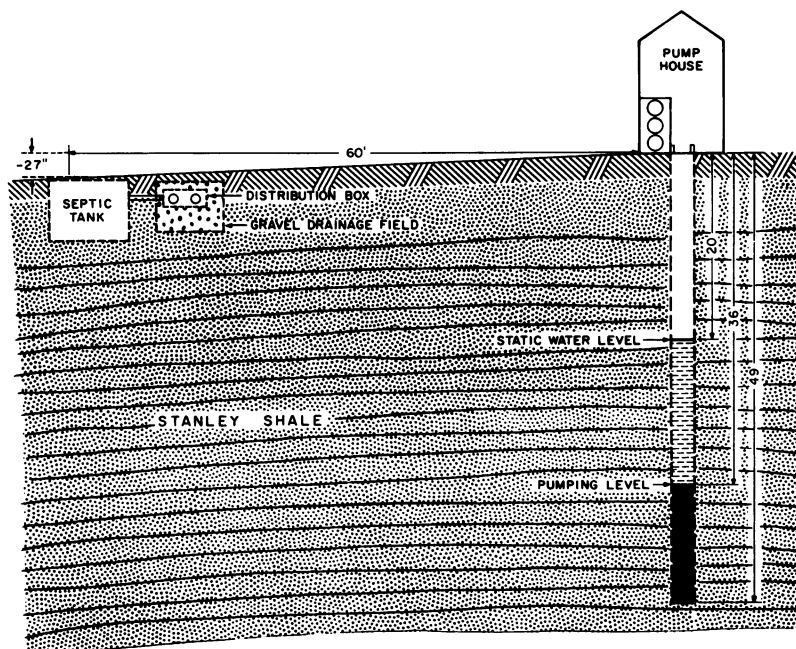
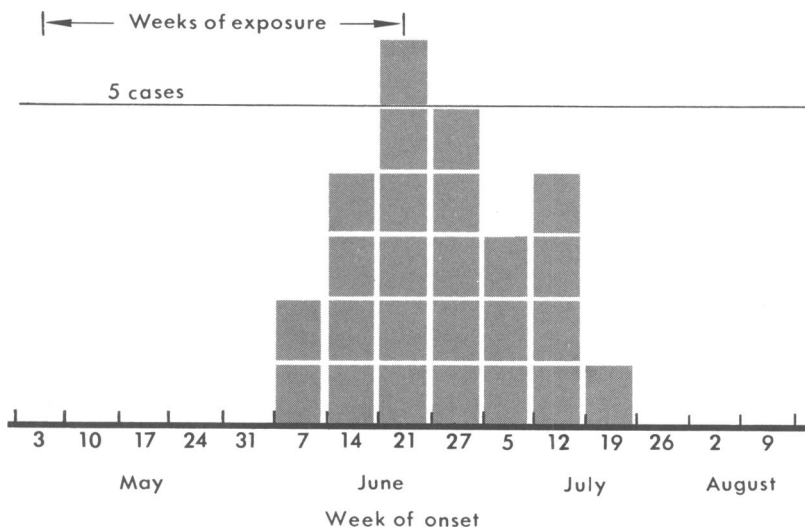


Figure 6. Relationship between exposure and onset of symptoms for 25 patients who patronized suspect cafe only once, Hatfield, Ark., 1970



The one patient who did not drink water had been to the cafe only once and had ordered an ice cream cone; the ice cream scoop had been washed and stored in the tapwater.

Control Measures

On June 21, when the bulk of epidemiologic evidence pointed to the cafe as the most likely

source of hepatitis, the proprietress voluntarily closed its doors. This action was probably the single most effective way to limit the spread of infection, as indicated by the sharp decline in incidence of hepatitis 1 month later.

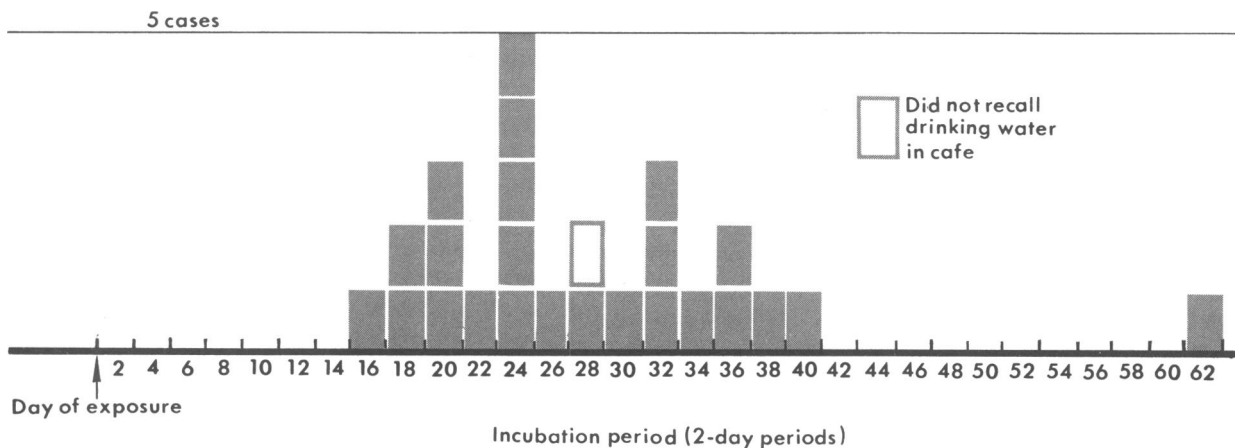
During the epidemic, local physicians administered immune serum globulin (ISG) to approximately 400 family contacts and close friends of patients, and on

July 15 ISG was administered to 455 additional residents of Hatfield and the surrounding area. Mass administration of ISG probably suppressed infection in some people who had been exposed to the cafe water and reduced the secondary attack rate among household contacts. During the epidemic period and following month, only six documented secondary cases were reported.

Water samples were collected from 10 locations in Hatfield in addition to the cafe; five samples were contaminated with coliform organisms. The U.S. Geological Survey in Little Rock reported that water wells in the Hatfield area were drilled in weathered zones of Stanley shale, which ranged in depth from several hundred to 1,000 feet. Because this type of rock formation permits lateral drainage of organic residues, several wells in Hatfield could have become contaminated by lateral septic tank drainage similar to that which occurred at the cafe.

It was recommended that all

Figure 7. Interval between exposure and onset of hepatitis for 25 patients who patronized suspect cafe only once, Hatfield, Ark., 1970



local residents have their water tested for coliform contamination and that water from unsafe wells be boiled. A long-range plan was suggested for the construction of a municipal water system using surface rather than ground water.

Discussion

Reports of epidemic waterborne hepatitis date back as far as 1895, when 34 cases of jaundice in King's Lynn, England, over an 8-month period were attributed to waterborne infection (8). Unfortunately, published epidemiologic data were insufficient to substantiate Plowright's conclusions. In 1916 a total of 14 cases of jaundice occurred over an 18-day period in workers at a Norwegian papermill. Well water from one section of the mill was thought to be responsible for the outbreak, but Andersson (9) could not explain how the well had become contaminated.

Since 1916 several well-documented outbreaks of waterborne hepatitis have occurred. Perhaps the best studied of these epidemics was reported by Neefe and Stokes in 1945 (10). They described 344 cases of hepatitis among 573 campers during a 7-week period in the summer of 1944. The source of infection was thought to be well water that had been contaminated by underground seepage of effluent from a cesspool. The infectivity of the well water was verified by volunteer experiments. Anicteric hepatitis developed in four of five volunteers, who ingested 7 liters of the suspect water, after incubation periods of 61 to 71 days. In addition, when bacteria-free fecal material from these men was given to five other volunteers, hepatitis developed in one.

In the epidemic among campers that Neefe and Stokes de-

scribed, a herald wave of gastroenteritis preceded the outbreak of infectious hepatitis by approximately 1 month. Epidemic gastroenteritis, however, is a relatively infrequent precursor to epidemic waterborne hepatitis. Of 40 outbreaks of waterborne hepatitis reported in English, only seven (10-16) were preceded by epidemic gastroenteritis. Similarly, no increased incidence of enteric diseases was noted in May or June among the people in Hatfield who drank water at the suspect cafe.

If present, epidemic gastroenteritis is useful for determining the date of exposure to waterborne infection and identifying the population at risk. In published reports in which the population at risk has been well delineated (7, 10, 12, 14, 15, 17-19) the average attack rate of icteric hepatitis has been 31.2 percent. In Hatfield it was not possible to ascertain how many persons had drunk water at the suspect cafe, but of 64 persons listed by the proprietress as regular customers, 15 developed hepatitis—an attack rate of 23 percent.

The source of contaminated water in the Hatfield cafe was a drilled well. Of 12 other published reports in which drilled wells were implicated, five attributed contamination to lateral underground seepage of effluent from cesspools or septic tanks through lime or shale fissures (2, 7, 10, 20, 21), three concluded that wells were infected by surface contamination (22-24), one cited a defective drain (17), and three did not identify the origin of contamination (13, 25, 26).

In Neefe and Stokes' classic article (10), the suspect cesspool was 150 feet from the drilled well that was the presumed source of the hepatitis virus.

Thus it seems quite reasonable that in Hatfield the well water was contaminated by effluent from a septic tank located 60 feet away. The high percentage of dwellings, other than the cafe, with contaminated water suggests that underground contamination of wells around Hatfield is a common occurrence and that all underground water in this area is subject to bacterial and viral contamination because of the geologic composition of the terrain.

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In May, June, and July 1970 there were 95 cases of infectious hepatitis among residents of Polk County, Ark., and surrounding counties in the State and in Oklahoma. Of the 95 patients, 79 or 83 percent had patronized one particular cafe in Hatfield, Ark., between mid-April and the end of July 1970. In a comparison group of 470 area residents who were not ill, only 90 or 19 percent had patronized the same cafe.

Epidemiologic and laboratory evidence incriminated the water used at the cafe as the most likely source of epidemic hepatitis. Of 78 hepatitis patients who had patronized the cafe, 76 or 97 percent had drunk water as compared with 29 or 55 percent of 53 non-ill patrons questioned. Although sanitary conditions inside the cafe ap-

peared to be excellent, the tapwater was found to be contaminated with coliform bacteria. Fluorescein dye flushed down the toilet in the cafe was demonstrated in the tapwater 20 days later. Lateral seepage of effluent from a septic tank through underground shale fissures was thought to be the most likely route in contamination of the cafe water.

Control measures included voluntary closing of the cafe by the proprietress in June and treatment of household contacts with immune serum globulin by local physicians. An immunization campaign for area residents was carried out in July to reduce the extent and severity of a secondary spread.